DIVISION 3

NOTES

Section 301. Subbase

301.01. Description

This work consists of constructing a granular subbase on a surface approved by the Engineer.

301.02. Materials

Provide material in accordance with the following section:

Granular Material Class II 902

301.03. Construction

Spread the subbase material evenly and compact to at least 95% of the maximum unit weight, at a less-than-optimum moisture content, for its entire thickness. Place the subbase in layers no greater than 18 inches. Where the required depth is more than 18 inches, place the material in layers of equal thickness. Construct the subbase to plan grade within a tolerance of plus 1 inch.

Do not place subbase on frozen, soft, unstable, or rutted subgrade. If subbase material becomes mixed with subgrade material, remove, dispose of, and replace the subbase material at no additional cost to the Department.

301.04. Measurement and Payment

Pay Item	Pay Unit
Subbase, LM	Cubic Yard
Subbase, CIP	Cubic Yard

A. **Subbase, LM.** The Engineer will measure **Subbase, LM** based on hauling unit dimensions and load count before placement and compaction. The unit price for **Subbase, LM** includes the cost of providing, hauling, placing, compacting, and grading the material.

B. **Subbase, CIP.** The Engineer will measure **Subbase, CIP** by the staked-section method as described in subsection 205.04. The unit price for **Subbase, CIP** includes the cost of providing, hauling, placing, compacting and grading the material.

Section 302. Aggregate Base Course

302.01. Description

This work consists of constructing an aggregate base course on a surface approved by the Engineer.

302.02. Materials

Provide materials in accordance with the following section:

Dense-Graded Aggregate 21AA, 21A, 22A.....902

Provide aggregate meeting the aggregate series shown on the plans.

302.03. Construction

A. **Placing and Compacting.** Provide a ticket with each load stating the following information:

1. Project number;
2. Aggregate source;
3. Aggregate series;
4. Date;
5. Time;
6. Truck identifier number;
7. Supplier name; and
8. Type of aggregate approval.

If the contract requires payment by weight, ensure the ticket includes the gross weight, tare weight, and net weight to the nearest 100 pounds. Determine the truck tare weight at least once daily.

If the contract does not require payment by weight, the Engineer may accept written documentation instead of tickets. Written documentation must identify the pay item of the material and include all of the information listed above except time and truck identifier number.

Provide and place aggregate with a uniform gradation, free of contamination and segregation. Do not place aggregate base on frozen, soft, unstable or rutted subgrade, subbase, or aggregate base. Do not rut or distort the subbase material or aggregate base during spreading.

The Contractor may use additives to facilitate compaction, shaping, and maintenance of the aggregate surface.

Compact the aggregate layers to a uniform thickness, no less than 3 inches and no greater than 8 inches. If placing aggregate base in a layer less than 3 inches, blend the new aggregate base material with the layer below to ensure a total of 6 inches. Blending must be performed to ensure that the new aggregate base material is uniformly mixed with the layer below.

Compact each layer of aggregate base to at least 98% of the maximum unit weight at a moisture content no greater than optimum for aggregate base under hot mix asphalt (HMA) pavement. Compact each layer of aggregate base to at least 95% of the maximum unit weight at a moisture content no greater than optimum for aggregate base under concrete pavement. Within the limits of bridge approaches, from the abutment wall to the typical roadway cross section, compact each layer of the aggregate base to at least 98% of the maximum unit weight. Shape the finished surface and the layer thickness to within ±½ inch of the crown and grade shown on the plans.

Remove, dispose of, and replace aggregate base material that mixes with subbase or subgrade material at no additional cost to the Department.

B. **Conditioning Aggregate Base.** Shape the finished surface of the existing aggregate base course to within ±½ inch of the grade and cross section shown on the plans. Provide additional aggregate to address irregularities and obtain the required grade or cross section.

If placing aggregate base in a layer less than 3 inches, blend the new material with the layer below to ensure a total of 6 inches. Blending must be performed to ensure that the new material is uniformly mixed with the layer below and compacted as specified in subsection 302.03.A.

C. **Maintenance During Construction.** Maintain the aggregate base course layer at the required line, grade, and cross section until placement of the next layer. Ensure the exposed aggregate base course layer remains smooth, compacted, and uncontaminated.

If the subgrade, subbase, or aggregate base is damaged due to the Contractor’s operations or construction traffic, restore to the required condition at no additional cost to the Department.

D. **Surplus Existing Aggregate Base Material.** Surplus existing aggregate base material meeting the material requirements described in this section may be used instead of providing new aggregate base material. Remove and dispose of surplus aggregate base material not being used elsewhere on the project and any unsuitable material in accordance with subsection 205.03.P.

302.04. Measurement and Payment

Pay Item	Pay Unit
Aggregate Base	Ton
Aggregate Base, LM	Cubic Yard
Aggregate Base, __ inch	Square Yard
Aggregate Base, Conditioning	Station, Square Yard
Aggregate Base, Conditioning, Surplus and Unsuitable, Rem, LM	Cubic Yard
Salv Aggregate Base, Conditioning, LM	Cubic Yard

A. **Aggregate Base.** The Engineer will determine the moisture content and pay weights in accordance with section 109.

The Engineer will measure **Aggregate Base** by the scale weight of the material, including admixtures, and moisture content no greater than 8%.

The Engineer will perform moisture tests at the start of weighing operations and if construction operations, weather conditions, or other causes may change the moisture content of the material. If tests indicate a moisture content greater than 8%, the Engineer will deduct the weight of the excess moisture from the scale weight of the aggregate until moisture tests indicate the moisture content is no greater than 8%.

B. **Aggregate Base, LM.** The Engineer will measure **Aggregate Base, LM** based on hauling unit dimensions and load count before placement and compaction. The unit price for **Aggregate Base, LM** includes the cost of providing, hauling, placing, compacting, and grading the material and providing water for compaction.

C. **Aggregate Base, __ inch.** The Engineer will measure **Aggregate Base, __ inch** by width and length for the specified depth as shown on the plans.

D. **Aggregate Base, Conditioning.** If the contract requires payment for **Aggregate Base, Conditioning** in station pay units, the Engineer will measure along the alignment of the roadway.

If the contract requires payment for **Aggregate Base, Conditioning** in area pay units, the Engineer will measure by the width and length shown on the plans.

If the contract does not include the pay item **Aggregate Base, Conditioning**, the Department will consider the cost of conditioning aggregate base and of providing additives and water for compaction and maintenance to be included in other aggregate base pay items.

E. **Aggregate Base, Conditioning, Surplus and Unsuitable, Rem, LM.** The Department will pay for **Aggregate Base, Conditioning, Surplus**

and Unsuitable, Rem, LM only if the Contractor removes material from the project site and disposes of it in accordance with subsection 205.03.P.

F. **Salv Aggregate Base, Conditioning, LM.** The Department will pay for **Salv Aggregate Base, Conditioning, LM** for use in other areas of the project only if existing aggregate base material requires loading and hauling. The Engineer will measure and the Department will pay for as **Salv Aggregate Base, Conditioning, LM** surplus material that is loaded and hauled from locations on the project to other locations in order to attain the plan grade or cross section. The Engineer will measure the material in its final location.

Section 303. Open-Graded Drainage Course

303.01. Description

This work consists of constructing an open-graded drainage course (OGDC) on a surface approved by the Engineer.

303.02. Materials

Provide materials in accordance with the following section:

Open-Graded Aggregate 4G.....902

303.03. Construction

A. **Preparation.** Provide and install the separation treatment, as specified on the plans, between the OGDC and the subbase or subgrade.

B. **Placement and Compaction.** Provide a ticket with each load stating the following information:

1. Project number;
2. Aggregate source;
3. Aggregate series;
4. Date;
5. Time;
6. Truck identifier number;
7. Supplier name; and
8. Type of aggregate approval.

If the contract requires payment by weight, ensure the ticket includes gross weight, tare weight, and net weight to the nearest 100 pounds. Determine the truck tare weight at least once daily.

If the contract does not require payment by weight, the Engineer may accept written documentation instead of tickets. Written documentation must identify the pay item of the material and include all of the information listed above except time and truck identifier number.

Place OGDC in accordance with subsection 302.03. When additional thickness is being used for equipment travel, the layer must not exceed 10 inches. Provide a finished surface that is smooth and uniform in appearance and free of loose aggregate, holes, depressions, ruts, and ridges. Do not place OGDC on frozen, soft, unstable, or rutted subgrade,

subbase, or aggregate base. Do not rut or distort the underlying layer during spreading.

9. **Control Strip.** Construct a 600- to 1,000-foot-long control strip at the start of the spreading operation to establish a construction method for placement and compaction that does not cause degradation or segregation detrimental to base stability and drainability. The Engineer will obtain an in-place sample from the control strip after compaction and final trimming and test for loss by washing (LBW) and gradation (Table 902-1). In addition, the density will be verified to meet the minimum 95% of the maximum unit weight with the moisture content not greater than optimum. Do not place OGDC beyond the limits of the control strip until an acceptable placement method is determined and verified by test results. When contiguous plan quantities are less than 10,000 square yards, the Engineer may waive the control strip requirement, but the minimum density requirement would still apply.

C. **Equipment Travel.** Place at least 2 inches more than the finished thickness of the OGDC layer on the grade prior to use for equipment travel. All costs associated with placement of the additional aggregate and removal or trimming thereof will be borne by the Contractor. Stockpile and retest any removed OGDC aggregate to verify that the aggregate meets the grading requirements in Table 902-1 for the intended item of use on this or any Department project.

Where no lateral space exists due to permanent physical obstructions, maintenance of traffic requirements, or other unavoidable conditions, delivering material to the paver by equipment traveling on the OGDC will be permitted provided that:

1. The specified in-place OGDC gradation is maintained and no other damage to the OGDC, subbase, or subgrade occurs; and
2. Varied truck routes or paths are used to minimize the potential for damage to the OGDC.

Correct all observed damage to the OGDC layer, subbase, or subgrade resulting from equipment travel according to subsection 303.03.B. Protect the underdrain system from damage at all times and locations.

D. **Testing and Acceptance.** The Engineer will determine the preferred sampling location and provide a written description to the Contractor at the pre-construction meeting and at the pre-bid meeting, if applicable. The Engineer may designate a revised preferred sampling location if circumstances change during construction. Provide mechanical methods to assist the Engineer with obtaining samples from the grade when layer thicknesses are greater than 4 inches. Make allowance for and be solely

responsible for degradation and segregation during shipment, placement, and compaction of the OGDC material.

1. **Daily Verification.** The Engineer will verify compactive effort or stability by one of the following options:

   a. **Proof Roll**. Complete a proof roll using equipment approved by the Engineer. The Engineer will witness and document the proof roll and determine the proper course of action to correct any observed rutting or displacement; or

   b. **Density Control Testing**. Perform in-place density control testing to verify that at least 95% of the maximum unit weight with a moisture content of not greater than optimum has been achieved for each individual layer.

   The Engineer may approve modifications to the construction method established during the construction of the control strip if the in-place gradation is not compromised and the compactive effort or stability can be verified.

   If the Engineer waives the control strip, in-place field testing is required to verify that placement and compaction methods are achieving at least 95% of the maximum unit weight with the moisture content not greater than optimum for each individual layer. In-place testing frequency will be the same as listed for aggregate base courses in MDOT's *Density Testing and Inspection Manual*.

2. **Notification Requirements.** Notify the Engineer if any of the following occur and construct a new 600- to 1,000-foot-long control strip:

   a. Changes in placement procedures including layer thickness;

   b. Equipment used in the placement of the previous control strip is removed from service or replaced; or

   c. A switch in the material source or blending of multiple sources.

   The new control strip must be tested and approved by the Engineer prior to the resumption of OGDC placement.

3. **Prior to Placement Acceptance Criteria.** Material not meeting the requirements in Table 902-1 will not be permitted to be placed on the grade.

4. **Compacted-In-Place Acceptance Criteria.** The Engineer may sample and test the compacted-in-place OGDC for final acceptance. If segregation, contamination, or excessive degradation is observed, the Engineer will provide written notification of the need for in-place testing. The notification will also define the limits of the area subject to

testing, not to exceed 500 feet in length for each occurrence. Discontinue OGDC placement upon receipt of the notification. Stop the paving operation at least 500 feet before the OGDC area subject to in-place acceptance testing. Do not resume OGDC placement and paving operations until directed by the Engineer. The Engineer may require the construction and testing of another 600- to 1,000-foot-long control strip in accordance with subsection 303.03.B.1. The Engineer will sample from within the defined area. Two additional samples will be obtained, one from each adjacent side of the defined area for in-place acceptance testing. Each test area will have a maximum length of 500 feet. All three acceptance tests will be completed within 48 hours of the time the samples were obtained from the project.

The in-place aggregate gradation for any test area, including control strips, must conform to the grading requirement in Table 902-1. Test results outside these gradation limits will be subject to pay adjustment or will be required to be removed and replaced in accordance with subsection 303.04.

303.04. Measurement and Payment

Pay Item	Pay Unit
Open-Graded Dr Cse, __ inch	Square Yard
Open-Graded Dr Cse, CIP	Cubic Yard
Open-Graded Dr Cse, Shld	Square Yard, Ton

A. **General.** The unit prices for the OGDC pay items include furnishing the crushed aggregate; placing, spreading, shaping, compacting, trimming, protecting the underdrain system and all costs associated with constructing control strips, corrective actions necessary to rectify degradation and segregation. The open-graded drainage course pay items are subject to the pay adjustments described herein.

B. **Open-Graded Dr Cse, __ inch**. The Engineer will measure **Open-Graded Dr Cse, __ inch** by width and length for the specified depth as shown on the plans.

C. **Open-Graded Dr Cse, CIP**. The Engineer will measure **Open-Graded Dr Cse, CIP** based on plan quantity by volume in cubic yards. The plan quantity will include all of the OGDC below the paved shoulder and median to the top of the proposed subbase, as defined by the plan typical sections. If the Engineer determines that it is not feasible to determine quantities based on plan quantities, the measurement for **Open-Graded Dr Cse, CIP** will be based on the staked-section method as described for roadway earthwork volumes in subsection 205.04.A.

D. **Open-Graded Dr Cse, Shld.** The Engineer will determine the moisture content and pay weights as specified in section 109.

If the contract requires weight measurement, the Engineer will measure **Open-Graded Dr Cse, Shld** by the scale weight, including additives, at a moisture content no greater than 8%. The Engineer will perform moisture tests at the start of weighing operations and when construction operations, weather conditions, or other causes may change the moisture content of the material. If tests indicate a moisture content greater than 8%, the Engineer will deduct the weight of the excess moisture from the scale weight of the aggregate until moisture tests indicate the moisture content is no greater than 8%.

If the contract requires area measurement, the Engineer will measure **Open-Graded Dr Cse, Shld** by width and length as shown on the plans.

E. **Pay Adjustment Computation.** Pay adjustments are not cumulative; only the largest of the computed sieve or LBW pay adjustments will be applied. All pay adjustments are negative. Pay adjustments are computed using the following formula:

Pay Adjustment = Pay Factor Reduction × (quantity) × (base price)

Where:

Pay Factor Reduction = value shown in Table 303-1 or 303-2 as applicable (expressed as a decimal)

quantity = quantity subject to adjustment

base price = unit price established by the Department and shown in the contract

Apply computed pay adjustments using Tables 303-1 and 303-2 for material tested in-place according to subsection 303.03.D.4.

Table 303-1:
Pay Factor Reduction for In-Place OGDC Exceeding Gradation Requirements on Any Sieve (excludes LBW)

Amount Exceeding Gradation Limit[(a)]	Pay Factor Reduction
1%	0%
2–3%	10%
4–6%	30%
>6%	[(b)]

(a) As shown in Table 902-1.

(b) The Engineer will require removal and replacement of the material or will apply a 50% pay factor to the material.

Table 303-2:
Pay Factor Reduction for In-Place OGDC
Exceeding Loss by Washing Requirements

Amount Exceeding Gradation Limit[a]	Pay Factor Reduction
<0.5%	0%
0.5–1.0%	20%
>1.0–1.5%	30%
>1.5–2.0%	40%
>2.0%	[b]

(a) As shown in Table 902-1.

(b) Removal and replacement of the material is required.

Section 304. Rubblizing Portland Cement Concrete Pavement

304.01. Description

This work consists of preparing, shattering, compacting reinforced or non-reinforced Portland cement concrete (PCC) pavement to provide a rubblized base, and disposing of surplus and deleterious material in accordance with subsection 205.03.P.

304.02. Materials

Provide material in accordance with the following section:

Dense-Graded Aggregate 21AA 902

304.03. Construction

A. **Equipment.** Use a water sprinkling system to suppress dust generated by pavement shattering operations.

For rubblizing pavement, use one of the following types of self-contained, self-propelled pavement breaking equipment:

1. Resonant frequency equipment producing a low amplitude breaking force; or
2. Multiple impact hammer equipment capable of lifting and falling in an independent, adjustable, random sequence with variable force of impact.

If impact hammer equipment is used, the number and spacing of hammers may vary. Ensure that the weights of individual hammers do not destroy the integrity of layers within 24 inches of the bottom of the rubblized pavement.

B. **Preparation Work.** Before beginning pavement rubblizing, complete all of the following:

1. Saw cut a relief joint full depth where rubblizing abuts concrete pavement that is required to remain or that will be rubblized in a later stage;
2. Construct the pavement widening or shoulders to match the elevation of the adjacent pavement requiring rubblizing;
3. Complete the construction of drainage systems for the new pavement structures, including outlet endings. Backfill and compact to the existing grade to prevent damage to the drainage system;
4. Remove pavement shown on the plans, or as directed by the Engineer, over utilities or pipes with less than 18 inches of granular

material cover as measured from the bottom of the pavement to the top of the utility or pipe. Extend the limits for pavement removal 3 feet beyond each side of a utility or pipe. Backfill the removal area with filler aggregate in layers no greater than 6 inches, and compact as approved by the Engineer.

Do not remove patching material until after rubblizing. Backfill the removal area with filler aggregate before compaction operations.

C. **Quality Control Checks.** Perform the following field checks and provide same-day documentation of the field checks to the Engineer:

1. At the start of and during rubblizing operations, establish, demonstrate, and document equipment capabilities, including speed and impact frequency.

2. At least once per lane and every 1,500 feet, as determined by the Engineer, inspect the rubblized pavement to determine whether the rubblizing operation has debonded the reinforcement from the concrete and is achieving the particle size specified in subsection 304.03.F. Perform the inspection as follows:

   a. Mechanically excavate an area of 25 square feet through the full depth of the pavement, taking care not to further rubblize. Notify the Engineer at least 2 hours before excavation to allow verification of results for acceptance.

   b. If the Engineer directs, perform spot inspections to the top of reinforcement using manual methods instead of mechanical methods. The inspections may be at the locations listed above (subsection 304.03.C.2) or at other locations chosen by the Engineer. Use a shovel or pick to excavate an area of 25 square feet. Use a geologist's pick or mason's hammer to separate the concrete pieces above the reinforcing mat. Remove as much material as possible and clean the remaining surface with a stiff-bristled broom or brush to expose the reinforcing mat. The Department considers the mat debonded if at least 80% of the mat is visible after excavation and sweeping.

   c. If performing inspections using manual methods, sound the concrete below the reinforcing mat to determine if material is fractured.

   d. Restore inspection sites with filler aggregate and compact. The Engineer may adjust the inspection frequency.

3. Ensure that the completed rubblized surface has a uniform appearance with no unbroken strips of pavement, exposed reinforcement, or visible joint filler and asphalt patching material.

D. **Compaction.** Before placing the HMA mixture, compact the rubblized pavement with vibratory steel-wheeled and pneumatic-tired rollers in the following sequence:

1. At least two passes with a Z-grid vibratory roller or steel drum roller as approved by the Engineer;

2. All subsequent passes with a pneumatic-tired or steel drum roller; except

3. The final pass just before HMA placement, which is with a steel drum roller.

The Department considers a pass down and back in the same path.

Provide rollers with a nominal gross weight of at least 10 tons. Operate vibratory rollers in a high vibration mode and at a speed no greater than 6 feet per second unless otherwise limited by the condition of the base, subbase, subgrade, or drainage features.

The Contractor may apply water if the Engineer approves.

After compaction and before placing HMA, ensure that the finished surface varies no more than ±1 inch when tested with a 10-foot straightedge. Fill voids and depressions with filler aggregate and compact.

E. **Miscellaneous.** Do not allow vehicular traffic on the rubblized pavement before HMA placement unless otherwise required for construction and maintenance of traffic, as approved by the Engineer. Maintain the compaction of portions of the rubblized pavement with no exposed reinforcement for crossroad or ramp traffic.

In part-width construction areas, rubblize the pavement to the limits of the required overlay for that stage. Saw cut the longitudinal joint deep enough to cut the tie bar unless rubblizing in a prior stage extended beyond the centerline and past the tie bar.

Do not damage items that are required to remain, including drainage structures and monument boxes.

F. **Acceptance Criteria.** The Engineer will observe quality control checks described in subsection 304.03.C and base acceptance on the following criteria:

1. PCC pavement shattered to full depth;

2. Non-reinforced PCC pavement and concrete pavement patches reduced to unbound particles with diameters less than 10 inches;
3. Reinforced PCC pavement and concrete pavement patches above the reinforcement reduced to unbound particles with a nominal diameter from 2 inches to 6 inches;
4. Reinforced PCC pavement and concrete pavement patches below reinforcement exhibit sporadic particles greater than 10 inches, provided the Engineer verifies debonding of reinforcement near the particle;
5. No oversized particles at the surface for PCC pavements;
6. Debonding of reinforced pavement achieved if the required particle size is met;
7. Exposed reinforcement has been cut off below the surface and removed. Embedded reinforcement may remain in place;
8. No visible joint sealant or asphalt patching material on the compacted surface, and voids filled with filler aggregate;
9. Joints and cracks greater than ¼ inch wide at the surface are not distinguishable; and
10. No displacement of underlying base, subgrade, or underdrains.

304.04. Measurement and Payment

Pay Item	Pay Unit
Pavt, Rubblize	Square Yard
Aggregate, Filler	Ton
Saw Cut, Rubblize	Foot

A. **Pavt, Rubblize.** The unit price for **Pavt, Rubblize** includes the cost of the following:

1. Required quality control work;
2. Rubblizing;
3. Dust suppression, including water;
4. Removing joint fillers and patching materials;
5. Cutting exposed steel, loading, hauling, and disposing of the steel and immediate restoration of disturbed rubblized concrete;
6. Breaking down or removing and disposing of oversized pavement pieces;

7. Disposing of material removed from inspection areas; and
8. Maintaining the condition of the rubblized pavement until placement of the HMA pavement.

B. **Aggregate, Filler.** The unit price for **Aggregate, Filler** includes the cost of producing, delivering, placing, leveling, and compacting the aggregate in rubblized pavement.

C. **Saw Cut, Rubblize.** The unit price for **Saw Cut, Rubblize** includes the cost of cutting a relief joint full depth where the rubblizing abuts concrete pavement that is required to remain or is removed for other purposes and cutting the longitudinal joint through the tie bars where necessary.

The Department will pay for concrete pavement removal separately as **Pavt, Rem** in accordance with section 204.

Section 305. HMA Base Crushing and Shaping

305.01. Description

This work consists of constructing an aggregate base from existing flexible pavement.

305.02. Materials

Provide material in accordance with the following section:

Dense-Graded Aggregate 21A, 21AA, 22A.....902

305.03. Construction.

Crush and shape hot mix asphalt (HMA) to the depth and width shown on the plans. The plans will also show construction staging and shoulder treatment. Obtain the Engineer's approval for the initial surfacing course HMA mix design before crushing begins.

A. **Equipment.** Provide a self-propelled rotary reduction crushing machine capable of crushing the pavement to the size required by the contract and mixing the crushed material with the underlying aggregate base to the required depth.

   Use a water sprinkling system to suppress dust generated by the pavement crushing operations.

   Provide final grading equipment that includes automatic cross slope and crown control. If no plan grades are provided, provide an automated system for referencing and averaging the existing surface for longitudinal control.

B. **Crushing and Shaping.** Unless otherwise approved by the Engineer, crush, shape, compact, and grade the first side of the roadway to the referenced grade prior to crushing and shaping the second side.

   Reference the longitudinal crushed grade from the existing pavement surface or the new HMA pavement surface for the second side.

   The Contractor may blade the existing shoulder asphalt or seal coat material onto the mainline pavement before crushing.

   Uniformly crush existing asphalt pavement, including 1 to 2 inches of the aggregate base to the required width and depth. Ensure that 95% of the crushed material has a maximum particle size of 1½ inches, and the remaining 5% contains no particles larger than 4 inches.

   Uniformly spread and compact the crushed material to the dimensions shown on the plans. Use salvaged crushed material, if available, or

dense-graded aggregate to add material to attain the plan grade or cross section. Spread added aggregate uniformly before crushing or placing aggregate on the crushed surface and remix to the full crushed depth.

C. **Compacting and Grading.** Compact the crushed material to at least 98% of the maximum unit weight. The maximum unit weight is to be determined using a representative sample of material that has a moisture content short of saturation and a maximum top size of 1 inch.

Repair base destabilized by overwatering or non-uniform water application, damaged by Contractor operations, or from maintaining traffic at no additional cost to the Department.

D. **Surplus Crushed Material.** The Contractor may use surplus crushed material as aggregate base or aggregate shoulder.

E. **Weather Limitations.** Do not crush HMA pavement if anticipated precipitation may destabilize the prepared base. Crush and shape HMA base in accordance with the weather limitations specified in section 501.

F. **Acceptance Criteria.** The Engineer will inspect crushing and shaping work and base acceptance on all of the following criteria:

1. Crushed material meets particle size requirements;
2. After final grading, the surface does not vary by more than ½ inch when tested with a 10-foot straightedge;
3. Immediately before paving, undulations or variations are corrected to meet the criteria in subsection 305.03.B and subsection 305.03.C; and
4. Required density is maintained until the HMA surface material application.

305.04. Measurement and Payment

Pay Item	Pay Unit
HMA Base Crushing and Shaping	Square Yard
Salv Crushed Material, LM	Cubic Yard
Material, Surplus and Unsuitable, Rem, LM	Cubic Yard

A. **HMA Base Crushing and Shaping.** The Engineer will base payment for **HMA Base Crushing and Shaping** on the width of the proposed HMA surface, in accordance with subsection 109.01.A, unless shown otherwise on the plans, regardless of any variation in depth.

The unit price for **HMA Base Crushing and Shaping** includes the cost of water to obtain the required density, and scarifying, crushing, grading, shaping, rolling, and compacting existing HMA.

B. **Salv Crushed Material, LM.** The Department will pay for **Salv Crushed Material, LM** for use in other items of work only if surplus crushed material requires loading and hauling.

   The Engineer will measure, and the Department will pay for, surplus material that is loaded and hauled from locations on the project to attain the plan grade or cross section, in the final location as **Salv Crushed Material, LM** or as shoulder or approach in accordance with subsection 307.04.

C. **Material, Surplus and Unsuitable, Rem, LM.** The Department will pay for **Material, Surplus and Unsuitable, Rem, LM** only if the Contractor removes material from the project site and disposes of it in accordance with subsection 205.03.P.

D. **Trenching.** The Department will pay separately for **Trenching** in accordance with subsection 307.04.

E. **Aggregate.** The Department will pay separately for additional aggregate as **Aggregate Base** in accordance with subsection 302.04. If **Aggregate Base** is not included in the contract, the Department will pay for additional aggregate as extra work.

Section 306. Aggregate Surface Course and Maintenance Gravel

306.01. Description

This work consists of constructing aggregate surface course on a prepared subgrade or existing aggregate surface.

306.02. Materials

Provide materials in accordance with the following sections:

Dense-Graded Aggregate 21A, 21AA, 22A, 23A, 23AA.....902
Salvaged Aggregate.....902

Provide Dense-Graded Aggregate 21A, 21AA, or 22A if the plans show aggregate surface course later receiving a paved surface. Provide Dense-Graded Aggregate 23A or 23AA if the plans show construction of aggregate surface without a paved surface. Provide Dense-Graded Aggregate 21A, 21AA, 22A, 23A, 23AA, or salvaged aggregate for temporary maintenance gravel.

306.03. Construction

A. **Preparation of Base.** When required, blade, or scarify and blade, existing aggregate surfaces to remove irregularities in the grade.

B. **Placing and Compacting.** Provide a ticket with each load stating the following information:

1. Project number;
2. Aggregate source;
3. Aggregate series;
4. Date;
5. Time;
6. Truck identifier number;
7. Supplier name; and
8. Type of aggregate approval.

If the contract requires payment by weight, ensure the ticket includes gross weight, tare weight, and net weight to the nearest 100 pounds. Determine the truck tare weight at least once daily.

If the contract does not require payment by weight, the Engineer may accept written documentation instead of tickets. Written documentation

must identify the pay item of the material and include all of the information listed above except time and truck identifier number.

Provide a uniform aggregate mixture, compacted in place to a uniform density full depth. Provide a complete surface course to the line, grade, or cross section as shown on the plans.

Place maintenance gravel at driveway and intersection locations as shown on the plans or as directed by the Engineer to provide a flush transition to driveways, intersecting cross streets, and adjacent surfaces where maintaining traffic. Grade maintenance gravel to provide positive drainage. Match the existing widths of the driveways and intersections as shown on the plans or as directed by the Engineer.

When construction operations progress to a point that maintenance gravel is no longer needed, as determined by the Engineer, remove the maintenance gravel on the same day as paving of the removal area. Remove and dispose of maintenance gravel in accordance with the standard specifications. If approved by the Engineer, the Contractor may leave maintenance gravel in place as part of the work.

Do not place aggregate on unstable surfaces, as determined by the Engineer. Maintain the aggregate in a smooth and stable condition until removed, surfaced, or project completion.

Compact the aggregate layers to a uniform thickness no greater than 8 inches. If placing HMA surface over the aggregate surface course, compact each aggregate layer to at least 98% of the maximum unit weight at a moisture content no greater than optimum. For other aggregate surface course applications, compact each layer of aggregate to at least 95% of the maximum unit weight at a moisture content no greater than optimum.

Grade the finished surface and layers to within ±½ inch of the crown and grade shown on the plans.

If placing aggregate base in a layer no greater than 3 inches, compact using pneumatic-tired rollers or vibratory compactors to at least 95% of the maximum unit weight at a moisture content no greater than optimum.

C. **Use of Additives.** The Contractor may use additives to facilitate compaction and for dust control.

306.04. Measurement and Payment

Pay Item	Pay Unit
Aggregate Surface Cse, __ inch	Square Yard
Aggregate Surface Cse	Cubic Yard, Ton

Maintenance Gravel, LM.....Cubic Yard
Maintenance Gravel.....Ton
Driveway Maintenance, Commercial .....Each
Driveway Maintenance, Residential.....Each
Intersection Maintenance.....Each

A. **Aggregate Surface Course.** The Engineer will measure **Aggregate Surface Cse, __ inch** by the width and length shown on the plans.

The Engineer will determine the moisture content and pay weights as specified in section 109.

If the contract requires weight measurement, the Engineer will measure **Aggregate Surface Cse** by the scale weight, including additives, at a moisture content no greater than 8%.

The Engineer will perform moisture tests at the start of weighing operations and when construction operations, weather conditions, or other causes may change the moisture content of the material. If tests indicate a moisture content greater than 8%, the Engineer will deduct the weight of the excess moisture from the scale weight of the aggregate until moisture tests indicate the moisture content is no greater than 8%.

The unit price for **Aggregate Surface Cse, __ inch** and **Aggregate Surface Cse** includes the cost of additives and water.

B. **Maintenance Gravel.** The Engineer will measure **Maintenance Gravel, LM** based on hauling unit dimensions and load count before placement and compaction. The unit price for **Maintenance Gravel, LM** includes the cost of constructing, maintaining, and removing the aggregate surface.

The Engineer will measure **Maintenance Gravel** in tons by the scale weight of the material. The Engineer will perform moisture tests at the start of weighing operations and if construction operations, weather conditions, or other causes may change the moisture content of the material. If tests indicate a moisture content greater than 8%, the Engineer will deduct the weight of the excess moisture from the scale weight of the maintenance gravel until moisture tests indicate the moisture content is no greater than 8%.

The Engineer will determine the moisture content and pay weights as specified in section 109.

C. **Driveway Maintenance, Commercial; Driveway Maintenance, Residential** and **Intersection Maintenance** includes construction, grading, maintenance, removal, replacement, and disposal of the aggregate surface. These items will be paid for once per location

regardless of the number of times the aggregate surface is placed, maintained, removed, or replaced.

Intersection Maintenance will be paid for separately for each approach of the highway, street, or alley that joins or crosses the roadway.

Section 307. Aggregate Shoulders and Approaches

307.01. Description

This work consists of constructing aggregate shoulders and approaches on a prepared subgrade or existing aggregate surface.

307.02. Materials

Provide material in accordance with the following sections:

Dense-Graded Aggregate 21A, 21AA, 22A, 23A, 23AA.....902
Salvaged Aggregate.....902

Provide the following aggregate grades for the class of shoulders and approaches required by the contract documents:

A. For Class I, provide Dense-Graded Aggregate 22A;

B. For Class I requiring a paved surface, provide Dense-Graded Aggregate 21A, 21AA or 22A;

C. For Class II, provide Dense-Graded Aggregate 23A or 23AA;

D. For Class III, provide salvaged aggregate, Dense-Graded Aggregate 23A or 23AA; and

E. For Class IV shoulders, provide existing shoulder material.

For salvaged materials, provide Engineer-approved salvaged aggregate or other material from existing roads or stockpile. Remove particles larger than 2 inches from borrow or salvaged materials and dispose of in accordance with subsection 205.03.P.

307.03. Construction

A. **Trenching.** Excavate, shape, and compact trenches to the width and depth required. For trenches under HMA, compact the bottom of the trench to at least 98% of the maximum unit weight at no greater than optimum moisture content. Compact the bottom of other trenches to 95% of the maximum unit weight. The Engineer may allow 95% if 98% of maximum unit weight cannot be achieved.

Take ownership of trenched material and dispose of in accordance with subsection 205.03.P at no additional cost to the Department.

Place and maintain traffic control devices in accordance with section 812 in shoulder areas that cannot be backfilled and compacted the same day. Bring shoulder material flush with existing pavement the next day or as directed by the Engineer.

B. **Constructing Shoulders and Approaches.** Provide a ticket with each load stating the following information:

1. Project number;
2. Aggregate source;
3. Aggregate series;
4. Date;
5. Time;
6. Truck identifier number;
7. Supplier name; and
8. Type of aggregate approval.

If the contract requires payment by weight, ensure the ticket includes the gross weight, tare weight, and net weight to the nearest 100 pounds. Determine the truck tare weight at least once daily.

If the contract does not require payment by weight, the Engineer may accept written documentation instead of tickets. Written documentation must identify the pay item of the material and include all of the information listed above except time and truck identifier number.

Provide aggregate with a uniform gradation, free of contamination and segregation when placed. Do not place aggregate shoulder and approach material on frozen, soft, unstable, or rutted subgrade; subbase; or aggregate base.

The Contractor may use additives to facilitate compaction, shaping, and maintenance.

If placing aggregate shoulder or approach material in a layer less than 3 inches, scarify with 2 inches of the layer below.

Do not rut or distort the subbase material or aggregate base during spreading. Place and compact material without damaging adjacent paved surfaces. Maintain aggregate material in a smooth, stable condition and provide dust control.

Maintain compacted aggregate flush with each layer of placed HMA.

Grade aggregate material to provide positive drainage off the shoulder.

C. **Density Requirements.** Meet the following density requirements:

1. **Class I Shoulders and Approaches**. Compact Class I shoulders and approaches to at least 98% of the maximum unit weight at no greater than optimum moisture content;

2. **Class II and Class III Shoulders and Approaches**. Compact Class II and Class III shoulders and approaches to at least 95% of the maximum unit weight at no greater than optimum moisture content, except for layers 3 inches or less; and

3. **Class IV Shoulders**. Compact Class IV shoulders to at least 95% of the maximum unit weight at no greater than optimum moisture content, except for layers 3 inches or less.

D. **Surplus or Unsuitable Aggregate Material.** The Contractor may use surplus or unsuitable aggregate in fills in accordance with section 205.

Take ownership and dispose of unused material in accordance with subsection 205.03.P at no additional cost to the Department.

307.04. Measurement and Payment

Pay Item	Pay Unit
Trenching	Station
Shld, Cl __	Ton
Shld, Cl __, LM	Cubic Yard
Shld, Cl __, CIP	Cubic Yard
Shld, Cl __, __ inch	Square Yard
Approach, Cl __	Ton
Approach, Cl __, LM	Cubic Yard
Approach, Cl __, CIP	Cubic Yard
Approach, Cl __, __ inch	Square Yard

A. **Trenching.** The Engineer will measure **Trenching** along each pavement edge.

The unit price for **Trenching** includes the cost of trenched aggregate reused in shoulders or approaches that does not require loading and hauling.

The Engineer will measure **Shld, Cl III, LM** and **Approach, Cl III, LM** at the final point of delivery. The Department will pay for trenched aggregate that is reused in shoulders or approaches and that requires loading and hauling as **Shld, Cl III, LM** and **Approach, Cl III, LM.**

The Engineer will measure, and the Department will pay for, trenched aggregate that is reused in fills as **Embankment** in accordance with subsection 205.04.

B. **Shoulder and Approach.** If the contract requires the Engineer to measure shoulder or approach contract items by weight, the Engineer will use the scale weight, including additives, unless the moisture content is greater than 8%. The Engineer will perform moisture tests at the start of

weighing operations and if construction operations, weather conditions, or other causes may change the moisture content. If tests indicate a moisture content greater than 8%, the Engineer will deduct the weight of the excess moisture from the scale weight of the aggregate until moisture tests indicate the moisture content is no greater than 8%. The Engineer will determine the aggregate moisture content and pay weights in accordance with section 109.

If the contract requires the Engineer to measure shoulder or approach contract items by area, the Engineer will take longitudinal measurements parallel to the center line. The Engineer will use the transverse dimensions shown on the plans.

If the contract requires the Engineer to measure shoulder or approach contract items by volume in place, the Engineer will use the lines and dimensions shown on the plans to measure volumes, compacted in place.

The Engineer will measure shoulder or approach LM pay items based on hauling unit dimensions and load count before placement and compaction. The unit prices for shoulder and approach LM pay items include the cost of providing, hauling, placing, compacting, and grading the material.

C. **Water.** The cost to provide and apply water to facilitate placement or compaction is included in the unit prices for related items of work.

Section 308. Geosynthetics for Base

308.01. Description

This work consists of providing and installing geosynthetic products on a surface approved by the Engineer.

308.02. Materials

Provide material in accordance with the following sections:

Geotextile Separator 910
Stabilization Geotextile 910
Road Grade Biaxial Geogrid 910

308.03. Construction

A. **Geotextile Placement.** Place or install geotextile separator or stabilization geotextile products in accordance with the manufacturer's installation guidelines and this subsection.

Do not operate equipment that is required to place backfill directly on geotextile products. Eliminate wrinkles or waves that develop during placement. Place the products in direct contact with the soil below before placing backfill on the geotextile products. Do not expose geotextile to ultraviolet degradation for more than 7 days.

Shingle-lap longitudinal and transverse joints at least 2 feet or seam the joints in accordance with the manufacturer's recommendations. Ensure that field or factory seams meet the minimum grab tensile strength for the product application. Do not use nylon thread for geotextile seaming. Place seams facing upward for inspection purposes. Repair tears or damage to the geotextile in accordance with the manufacturer's recommendations.

B. **Geogrid Placement.** All areas immediately beneath the installation area for the geogrid must be properly prepared as shown on the plans, as specified, or as directed by the Engineer. Place or install the geogrid in accordance with the manufacturer's installation guidelines and this subsection.

To prevent undue exposure or damage to the geogrid, place only the amount of geogrid required for immediately pending work. Do not expose geogrid to ultraviolet degradation for more than 7 days.

The geogrid must be unrolled parallel to the centerline of the roadway. Place the geogrid taut prior to placement of subsequent aggregate layer. Anchor the geogrid in position after placement until placement of the subsequent aggregate layer. Overlap adjacent rolls of geogrid 2 feet minimum. Whenever possible, the placement of the subsequent

aggregate layer must proceed from the centerline of the geogrid placed out to assist in tensioning the geogrid. Place at least 6 inches of the subsequent aggregate layer over the geogrid before allowing construction vehicles on the geogrid.

C. **Aggregate or Granular Material Placement.** Spread and shape the subsequent layer of aggregate or granular material after placing geosynthetic to create a stable work platform before compaction. Place additional aggregate or granular material, as required by applicable sections, and compact. Fill ruts with additional aggregate or granular material and compact before placing each subsequent layer.

308.03. Measurement and Payment

Pay Item	Pay Unit
Geotextile, Separator	Square Yard
Geotextile, Separator, Non-Woven	Square Yard
Geotextile, Stabilization	Square Yard
Geotextile, Stabilization, Non-Woven	Square Yard
Road Grade Biaxial Geogrid	Square Yard

A. **General**. The Engineer will measure **Geotextile, Separator; Geotextile, Separator, Non-Woven; Geotextile, Stabilization; Geotextile, Stabilization, Non-Woven; and Road Grade Biaxial Geogrid** in place to the limits shown on the plans.

Geotextile, Separator; Geotextile, Separator, Non-Woven; Geotextile, Stabilization; and **Geotextile, Stabilization, Non-Woven** include furnishing the material, labor, and equipment required to furnish and place geotextiles and all materials and labor required to create seams. No allowance will be made for overlap, splices, or material cut off or wasted.

Road Grade Biaxial Geogrid includes furnishing the material, labor, and equipment required to furnish, place and anchor the geogrid, and any hand work necessary to establish grades and make geogrid splices. No allowance will be made for overlap, splices, or material cut off or wasted.

The cost of aggregate or granular material, including additional quantities required to fill ruts, is included in the unit prices for related pay items.